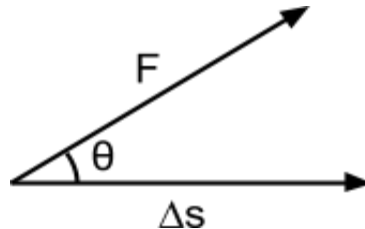


WORK:

$$W = F_x \Delta x$$

When force is done at an angle,



$$W = |F| |\Delta s| \cos \theta$$

No work is done if there is no change in s (displacement, Δs).

Work is relative and has no direction (is a scalar quantity). Has Nm (Newton meters) or J (joules).

DOT PRODUCT

$$W = F \cdot \Delta s = |F| |\Delta s| \cos \theta$$

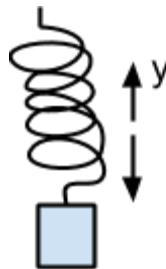
Vector multiplication \rightarrow scalar result

$$W = F \cdot \Delta s = F_x \Delta s_x + F_y \Delta s_y + F_z \Delta s_z$$

Normal force does zero work because it never causes any movement.

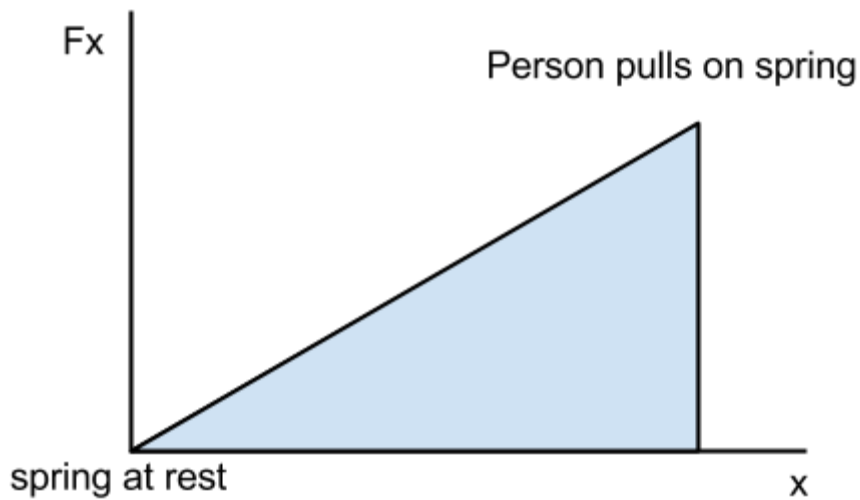
Friction gives negative work to an object because we consider the direction of movement is positive and friction always opposes an object's motion.


SPRING



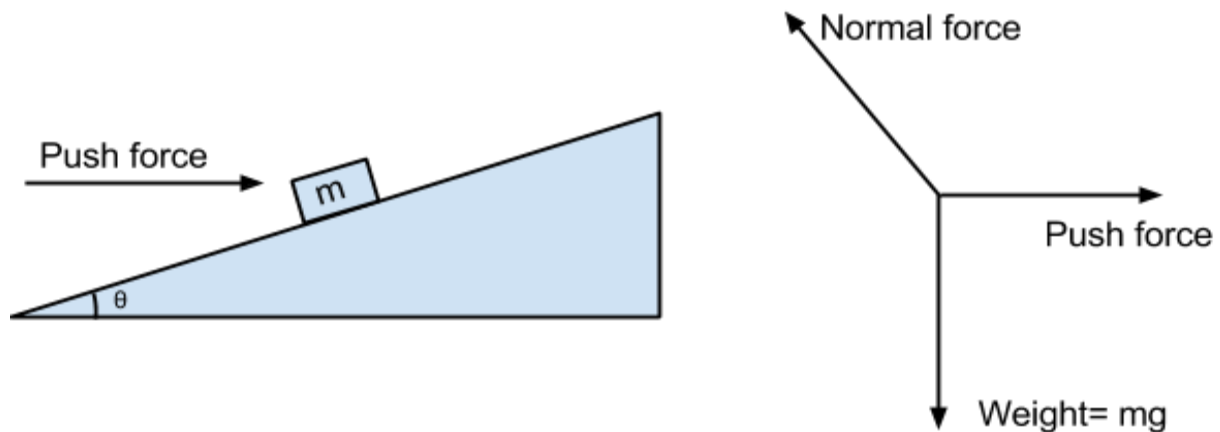
$F = -ky$, where k is the spring constant.

If F changes over position, over time: $W = \int_a^b (F) ds$



 Area under line = work done

Eg. Horizontal force (F_P) is exerted on a block on a frictionless inclined plane when the displacement along the ramp (Δx) is known.



$$W_P = F_P \Delta x \cos \theta$$

$$W_g = F_g \Delta x \cos(\theta + 90^\circ)$$

$$W_N = F_N \Delta x \cos(90^\circ) = 0$$

KINETIC ENERGY

$$a \Delta x = \frac{v_x^2 - v_o^2}{2}$$

$$W_{Total} = F_x \Delta x = m a_x \Delta x$$

$$W_{Total} = \frac{v_x^2 - v_{ox}^2}{2} = \Delta KE$$

$$KE = \frac{1}{2}mv^2$$

POTENTIAL ENERGY

Represented by: PE or U_g

Where W_g = Work done by gravity and h is the height of the object.

$$U_g = -W_g = mgh$$

A force is conservative if the net work done by the force on an object moving around any closed path is zero. (friction is not conservative, gravity and springs are)

